

AAAV — At the Brink of Prototype

Marine Brig. Gen. James “Jim” Feigley Leads Team Effort to Deliver Nation’s Most Advanced Amphibious Assault Vehicle

COLLIE J. JOHNSON

“...Defense acquisition has always been, is now, and I believe will remain in the future, principally a human endeavor. And while we can create a lot of processes, use a lot of tools by which to improve and speed up our work, all the important things sooner or later come down to people, their intellectual abilities, and their capability to work with other people. Those out there who think that it’s otherwise have something to learn.”

—Marine Brig. Gen. James “Jim” Feigley



At a Pentagon ceremony on May 4, Secretary of Defense William S. Cohen presented the David Packard Excellence in Acquisition Award to the U.S. Marine Corps, Department of the Navy Advanced Amphibious Assault Vehicle Program Team. The team achieved significant reduction in total ownership cost through implementation of cost as an independent variable, integrated product and process development, and virtual prototyping.

Marine Brig. Gen. James “Jim” Feigley is no stranger to amphibious warfare and equipment. Commissioned a Marine Corps infantry officer in 1972, he has spent the better part of his 26-year career either commanding amphibious assault units or working at staff levels directly associated with ground/amphibious assault vehicle systems.

In June 1993, the Navy handed Feigley — by now an experienced amphibious warfare officer and acquisition professional — perhaps the biggest challenge of his career: Direct Reporting Program

Manager for the Advanced Amphibious Assault Vehicle (AAAV). Classified as an Acquisition Category ID (ACAT ID) program, AAAV remains the *only* ground combat major defense acquisition program so designated throughout the Marine Corps.

Designed to replace the current Marine amphibious assault vehicle (AAV7A1), AAAV is a tracked armored personnel carrier, yet not entirely; a fighting assault vehicle, yet not entirely; a high-speed water craft, yet not entirely. It is all of these and more in one unique package — a technologically superior, powerful,

and flexible amphibious vehicle, capable of changing from land-based operations to sea in *45 seconds*.

Why the Need?

Feigley explains that the need for AAV stems not only from the Marine Corps' view of its contribution to national defense in the future, but also its view of how the world geo-political climate will evolve in the next 20 years. Because the majority of the world's centers of gravity for commerce, technology, population, and politics will be primarily located along the shorelines or littoral regions of the world, and many of those countries are in transition or actual conflict, it was clear to the Marine Corps some years ago that there was a need for a concentration of military capability that can operate in those littoral regions.

With that as a given, the Marine Corps looked at the kind of systems that it had or could modify in order to provide the capability to operate in littoral regions, or what it could do to compensate by changing doctrinal tactics. None of these alternatives worked and thus the need for a new approach was required.

"When one looks at the need to conduct military operations in littorals," says Feigley, "and applying the principles of maneuver warfare to amphibious operations, it was clear our current capability could never do the job, and what fell out was a need for a self-deploying, high-speed amphibious vehicle — the AAV."

In 1987, the Marine Corps developed a mission need statement for just such a vehicle, followed by not only a Defense Acquisition Board Review but also a Defense Resources Board Review. As a result of the two reviews, DoD gave the go-ahead in 1988, basically allowing the Marine Corps to proceed into concept exploration.¹

It Takes a Team

In June 1993 the Navy was looking for one good Marine to run the program. And Feigley was their man. True to his Marine training, he hit the ground running as the Direct Reporting Program Manager for the Advanced Assault Am-

phibious Vehicle Program.² First established as a Pilot Program for the Department of the Navy's Acquisition Reform Office initiative "Partnering with the Fleet," the AAV is currently scheduled to begin prototype testing in August 1999, and initial operational capability in 2006.

Such an ambitious schedule required that Feigley assemble the right team to manage and develop the world's most sophisticated amphibious assault vehicle — an amphibious vehicle that could indeed withstand the rigors of warfare well into the 21st century. In his words, Feigley was looking for "a dedicated team, requiring a mixture of skills and the right balance of DoD and Navy officials, defense contractors, and civilian acquisition professionals."

And since a strong team effort was absolutely vital to program success, the Integrated Product Team (IPT) and Integrated Product and Process Development (IPPD) team concepts were the strategies chosen to bring the program from inception to prototype. Ultimately, the IPT — institutionalized throughout DoD in 1994 by Dr. Paul G. Kaminski [former Under Secretary of Defense for Acquisition & Technology] as an important Acquisition Reform strategy — was to form the very backbone of the AAV Program.

Says Richard "Rich" Bayard, Assistant Program Manager, "Once General Dynamics Amphibious Systems was awarded the contract in June 1996, we began to staff the organization to its required levels over the next two or three

AAV PROGRAM - TIMELINE

Event	Date
First mission analysis - identified significant deficiencies in the current Marine Corps amphibious vehicle.	1987
Submitted Mission Need Statement to look at possibility of replacing current Marine Corps amphibious vehicle.	1988
Defense Acquisition Board Review and Defense Resources Board Review resulted in a memorandum to the Marine Corps, allowing the Service to proceed to concept exploration phase	June 1988
Technology base intensified, resulting in the development of important, basic technologies for high-speed amphibious vehicles, operators, and maintainers	1988 to 1999
Cost and Operational Effectiveness Analysis put together from 13 different alternatives to current system (included not only amphibious vehicles, but non-amphibious vehicles and non-vehicle alternatives).	
Contracts awarded to General Dynamics Land Systems and United Defense, LP [formerly FMC Corporation], to develop basic concepts for AAV — Favorable recommendation from Defense Acquisition Board	March 15, 1995
Request for Proposal (RFP) published	1995
Contract awarded to General Dynamics	June 1996
Government team members relocate to Woodbridge facility alongside their industry counterparts.	Aug.-Sept. 1996
Requirements/Design Review	Sept.-Dec. 1996
Preliminary Design Review (Prototype)	December 1997
Critical Design Review (Prototype)	June 1998
First prototype assembled at Woodbridge facility	Dec.1998-June 1999

BRIG. GEN. JAMES "JIM" FEIGLEY, U.S. MARINE CORPS COMMANDER, MARINE CORPS SYSTEMS COMMAND (MARCORSYSCOM)

Direct Reporting Program Manager Advanced Assault Amphibious Vehicle (AAAV) Program June 1993 — August 1998

Brig. Gen. James M. "Jim" Feigley was promoted to his current rank and became the Commander, Marine Corps Systems Command, Quantico, Va., in August 1998. Prior to assuming command of MARCORSYSCOM, Feigley was promoted to the rank of colonel in 1993 and subsequently assigned as the Direct Reporting Program Manager, AAAV.

Feigley joined the Marine Corps' Platoon Leaders Class pre-commissioning program in December 1969 while an undergraduate student at the University of Wisconsin — Oshkosh. After receiving his Bachelor of Science degree in 1972, he was commissioned a second lieutenant and attended infantry officers training at The Basic School, Quantico, Va. Upon graduation in 1973, he was ordered to the 3rd Marine Division in Okinawa, Japan, and was assigned to the 1st Amphibian Tractor Battalion.

Soon thereafter, he deployed with Battalion Landing Team 1/9 to the Western Pacific as a Tracked Vehicle Platoon Commander. In 1974 he was promoted to first lieutenant and was ordered to the Marine Corps Recruit Depot, San Diego, Calif., where he served as a Recruit Series Commander and the Officer in Charge of the Physical Training Unit.

He was promoted to captain in 1977 and was subsequently ordered to attend the Amphibious Warfare School at Quantico, Va. Upon graduation in 1978, he was ordered to the 2nd Marine Division at Camp Lejeune, N.C., and was assigned to the 2nd Assault Amphibian Battalion. While there, he served as a Company Executive Officer, Company Commander, and Battalion Operations Officer, and deployed with Regimental Landing Teams Two and Eight for NATO exercises in Northern Europe and the Eastern Mediterranean.

In 1981 he was ordered for duty with the 3rd Marine Division in Okinawa, Japan, and assigned to the 1st Tracked Vehicle Battalion. There he served as a Company Commander and deployed with his unit to Korea for Joint Allied exercises. In 1982 he was promoted to major and ordered to the Naval Training Equipment Center, Orlando, Fla., as a Liaison Officer and later, the Project Manager for Marine Corps ground training and simulation equip-



ment. During his tour, he attended the Project Managers Development Course at the Army Logistics Management Center, Ft. Lee, Va.

Following his selection for career-level school in 1985, he attended the Marine Corps Command and Staff College in Quantico, Va. Upon graduation in 1986, he was ordered to Headquarters, U.S. Marine Corps, Washington, D.C., to serve as a project officer in the Weapons Branch, Office of the Deputy Chief of Staff for Installations and Logistics.

Following reorganization of Marine Corps development and procurement activities, he was assigned to the newly formed Marine Corps Research, Development and Acquisition Command, Washington, D.C., as a project officer in the Armored Combat Vehicle Directorate. During this tour of duty, he attended the Program Management Course at the Defense Systems Management College, Ft. Belvoir, Va.

Upon Marine Corps initiation in 1988 of a major defense program to replace the current fleet of assault vehicles, he was transferred first to the Naval Sea Systems Command, Washington, D.C., and subsequently to the Department of the Navy, Direct Reporting Program Manager, Advanced Amphibious Assault office for duty as the Assistant Program Manager. In August of 1989, he was promoted to the rank of lieutenant colonel.

His personal decorations include the Legion of Merit, Meritorious Service Medal with gold star, and the Navy Achievement Medal with gold star. Feigley is married to the former Peggy Pipia of Milwaukee, Wis.

months, both on the General Dynamics side and the government Program Management Office side, to tackle the work we had ahead of us, which was designing this very capable AAAV.

"We included a requirement," he adds, "for an integrated product team structure in our plans for the concept exploration and demonstration/validation... General Dynamics then developed their own 'Concept Board' against that requirement. The integrated product team concept that General Dynamics put forward matched Dr. Kaminski's notion of what it should be, which is a team of highly diverse individuals, all drawn from different disciplines within the organizations."

According to Bayard, the AAAV Program Management Office works with several IPTs that are individually led by General Dynamics Amphibious Systems employees (team members). Each team has engineers, logisticians, finance managers, and U.S. Marines. Team members also include representatives from the Defense Contract Management Command, as well as representatives of various subcontractors and the various technical disciplines related to building, operating, and fielding the AAAV.

Says Bayard, "It was two years into the contract that it took us to come up with a really good design for AAAV. That two years was filled with a lot of tremendous effort by engineers, logisticians, Marines, and acquisition professionals from both General Dynamics and government.

"We were doing analyses after analyses, trade-off study after trade-off study, trying to determine the best components and subsystems for AAAV, trying to determine what capabilities AAAV really should have in both lethality and survivability, and in land and water mobility — all those IPTs were working together toward the same common objective."

Feigley confirms that most of the decisions are made by IPT members. But on occasion, he shares "tie-breaker"

decisions with his industry counterpart, Michael D. "Mike" Bolon, Vice President of General Dynamics Amphibious Systems. Says Feigley, "We're really more (even though I dislike the word) 'facilitators' if you will."

He sees their role as more of "being there" when the need arises, for example, to redirect resources or apply different kinds of resources to a problem that an IPT in and of itself can't resolve.

"That's really our purpose," he explains. "To provide things, break the ties, and nudge people along, not to be the design czars or the all-knowing folks who design the vehicles." That task, he acknowledges, is very capably being handled by others at the Woodbridge facility.

Collocation Vital to Program Success

Once Feigley recommended and received approval to collocate, in June 1996 he headquartered his entire government team in the same facility occupied by the prime contractor, General Dynamics Amphibious Systems.³ Called the AAV Technology Center, this Woodbridge, Va., facility was up and running, with computer systems working, within 60 days after contract award.⁴ Thus far, collocation has proven to be a smart move for several reasons:

- Dramatically reduces the amount of time it takes for the government and contractor to resolve design decisions.
- Enhances mutual understanding of the program manager's expectations, eliminating unnecessary effort.
- Reduces and changes the required number of deliverables and review processes.
- Allows concurrent approval by the government when the IPT finalizes a document.
- Greatly facilitates communications among team members. Team members identify and solve problems as they occur, and enjoy a reciprocal sharing of Marine Corps and corporate cultures, intellectual, and physical resources.



"The way we got to the Critical Design Review was quite a contrast from most programs that I'm familiar with. And it relates to the fact that while this is predominantly an engineering effort and the products are the products of the engineering staff, the program's success stems from the cooperation of all the disciplines, and in many cases the leadership of the business side."

Speaking of the collocation, Feigley acknowledges that it was somewhat of a collective idea based on the team's past experiences with managing programs.

"As the program manager, I put the idea forward and promoted it because it just made good sense. It was something that I think was a byproduct of our collective experience in doing it the old way where the government often had a contract with a defense contractor, or in a worst-case scenario, multiple contracts with multiple defense contractors."

He goes on to compare collocation with the way things used to be. "The old way would be to gather up a team every three to six months, fly to the contractor's facility, and then spend days there going through hundreds and hundreds of vu-graphs; and once there, only then being made aware of problems that have, in some sense, been manifesting themselves for months; and finally, attempting to resolve those issues and provide the contractor with the kind of guidance or information needed to go forward and execute the contract."

Says Feigley, "My team has done that for years. General Dynamics' folks have done that for years. We were all in agreement that that wasn't an efficient or an effective way of doing business. And because there was nothing that said we couldn't do it...we thought we'd just jump right into it and give it a try."

Mike Bolon also weighs in on the importance of collocation.

"From General Dynamics' point of view, a big advantage as a contractor is that it enables every employee and subcontractor to have daily and direct participation with Marine Corps and government acquisition people, and leads to much greater depth of understanding with regard to the impact of all the day-to-day decisions over the whole life cycle of AAV."

"Collocation is the most effective way to assure that daily eyeball-to-eyeball contact. People — either real users or representatives of government interests — have

really communicated as a result of collocation, anticipating problems before they happen, and when they inevitably do occur, quickly resolving them. That's the key outcome of collocation," Bolon concludes.

Rich Bayard summarizes the prevailing opinion on collocation in a few succinct words:

"All our government folks came from managing other programs somewhere within the Department of Defense. And if you were to ask any one of them if they would go back to doing business in the old environment, they would say 'no way.' This is the only way to do business. IPTs and collocation are the best possible way to develop a weapons system for DoD."

Into the 21st Century

Bolon and Feigley speak unreservedly of their commitment to see the AAV fielded. And both are quick to point out what AAV will do for the warfighter over and above the current capability.

"Our [General Dynamics] view of the AAV Program," says Bolon, "is that we're committed to making this a long-term partnership for many years to come. The immediate contract runs through 2001, but our goal is to help the Marines get AAV into the fleet starting in the next century.

"What we're really trying to do with AAV," he emphasizes, "is not only build a system that's effective and meets the military's need, but one that's affordable and can be operated and maintained throughout the entire 30-year expected service life of the vehicle."

Bolon states that General Dynamics views AAV's capabilities as the platform for the future.

"Given the kind of defense picture that has emerged post-Cold War, along with the need to 'go anywhere, be effective when you get there, and get the job done the first time in,' AAV is a perfect

match," Bolon says, for such a flexible platform that can, essentially:

- Go anywhere at high speed.
- Get there protected against nuclear, biological, and chemical attack.
- Get there protected against medium-caliber, direct-fire weapons.
- Get there with sufficient firepower to be hard-hitting.
- Protect the infantry as they go out and do their mission.

Says Bolon, "We see this as a capability that will be better understood once it is deployed, and once deployed, will lead to offshoots, derivatives, and international interest. We're absolutely convinced that this is the platform for the next century."

Feigley also speaks of the increased capability AAV will bring to the fleet, using this analogy as a fitting comparison:

"We're at a point where aircraft were in the late 1940s when they transitioned from propeller aircraft to jet aircraft. The difference in capability is just that significant when compared to the amphibious vehicles we have today, and what AAV will provide a few years from now."

Open Sea

"From a performance perspective, it [AAV] brings a geometric increase in water speed," says Feigley. Extensive rigorous ocean testing of General Dynamics' hydrodynamic test rig has already

demonstrated that AAV can traverse the sea at speeds in excess of 25 knots. Its twin 23,000-plus-pound thrust water jets use a 2700 horsepower engine for seaborne operations.

On open seas, AAV will also have the ability to travel 25 miles at sea plus 250 miles on land. Perfectly suited for coastal and riverine operations, it will have the ability (as mentioned at the beginning of this article) to change from land-based operations to sea, in less than 45 seconds.

"Our goal," Feigley continues, "is to operate in the littorals, but operate in such a manner that we can use the ocean as a means to maneuver our forces and thereby avoid the kind of casualty-producing, attrition-style warfare that has unfortunately been associated with amphibious operations in the past. And this speed, this ability to negotiate what has historically been a physical barrier — the ocean — and turn it into a maneuver space, is a dramatic change and something that cannot be implemented fully until AAV is fielded."

Adds Rich Bayard, "AAV allows the Marine Corps to execute its 21st century doctrine of operational maneuver from the sea, specifically because of its high water speed capability, which no amphibious vehicle in the world's inventory has right now."

Land

On land, the AAV is equally impressive. With a suspension made by Cadillac Gage, the AAV will have all the mobility of the M1A2 battle tank. It will



have the ability to overcome an eight-foot trench and three-foot-high vertical walls. On a flat top surface, it will top almost 45 mph. Carrying up to 400 gallons of fuel, it will run off jet petroleum or any grade of diesel.

In harsh conditions at the Army's Aberdeen Proving Ground, Md., the AAVV automotive test rig exceeded all of the Marine Corps' land mobility requirements.

Survivability

Despite its speed and maneuverability, the AAVV would not be combat effective without an armored hull. Feigley notes that there's a doubling of the armor protection level in the AAVV compared to the current system, which is another plus for protecting its valuable cargo — 17 fully combat-loaded Marine warfighters.

To provide the protection required for expeditionary warfare, the AAVV design incorporates tailored armor packages that effectively shield the vehicle against mines, defeat multiple projectile impacts, and minimize the effects of potentially lethal spall or splintering...all while offering a safer, easier ride. In fact, several features have been added to make the ride safer and easier.

- Climate control, which keeps the temperature inside the AAVV at 85 degrees on a 120-degree day.
- A nuclear, biological, and chemical warfare system that allows for full operation in a fully contaminated environment with the hatches closed.
- Automatic fire extinguishing system.
- Armor that can withstand 14.5mm armor piercing rounds at 300 meters, 155mm fragments at 15 meters, and stop anti-personnel mines.
- Passenger seat belts, allowing those inside to survive 360-degree rollovers.
- Capability to withstand up to five seconds of total submersion at sea.

State-of-the-Art Computer Technology

Computer technology is a big, big feature of the AAVV design — all told, more than one million lines of code. In spite of that advanced digital operating envi-



"We have always been very straightforward with Congress on what we've done well, areas where we have made mistakes, or areas where we had temporary setbacks. I think that's helped us in many ways. And Congress, in turn, has been supportive of AAVV."

ronment, AAVV remains easy to use. That same technology will also make the vehicle easier to troubleshoot, diagnose, and repair. Fault isolation computer technology and computerized technical repair manuals and records will make figuring out how to fix a problem easier.

According to Feigley, "Overall, from an operational perspective, it [AAVV] is easier to operate and maintain...truly a big

leap forward in combat vehicles from a technology and survivability perspective — an incredibly big jump."

Best-Value Prime Contractor

Feigley is candid about the government's choice of a prime contractor for the AAVV. "It was a best-value contract," he explains. "We were attempting to achieve a balance between cost and performance. There were a variety of different factors that were evaluated, such as our analysis of the risk of each contractor's technical approach.

"Another winning attribute, which I think was extremely important, was realism — the realism of each contractor's cost proposal compared to what they were actually intending to do in their technical proposal. And as it turned out," says Feigley, "not only did they [General Dynamics] have the most realistic proposal in our opinion, but they had the best technical approach at the lowest price."

Acquisition Reform and the AAVV Program

Feigley doesn't need much encouragement to talk about his team, their outstanding level of cooperation, and the work they've accomplished to date. And a large part of that work, he notes, has been done under the auspices of Acquisition Reform and all it embodies.

IPTs and IPPD

The AAVV Program Team is developing the vehicle completely under the concept of Integrated Product and Process Development (IPPD). Integrating experienced assault amphibian officers and staff noncommissioned officers in addition to the highly professional government engineering staff into all 28 of the program's IPTs, according to Feigley, provided for timely and thoughtful resolution of every engineering challenge, always with the Marine warfighter — the ultimate end user — in mind.

Says Feigley, "The way we got to the Critical Design Review was quite a contrast from most programs that I'm familiar with. And it relates to the fact that while this is predominantly an engineering

ADVANCED AMPHIBIOUS

The Team Behind



WRENCHES DON'T COME MUCH BIGGER THAN THIS ONE. MARINE BRIG. GEN. JAMES "JIM" FEIGLEY PICTURED WITH THE AAV ASSISTANT PROGRAM MANAGER, RICHARD "RICH" BAYARD, AT THE AAV TECHNOLOGY CENTER IN WOODBRIDGE, VA.



SOMEONE HAS TO "COUNT THE BEANS" AND TAKE CARE OF BUYING. KATHLEEN FRANCIS, PICTURED HERE WITH FEIGLEY, IS THE AAV DIRECTOR OF COST ESTIMATING AND PROCUREMENT.

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THEY'RE NOT MARINES, BUT GENERAL DYNAMICS AMPHIBIOUS SYSTEMS (GDAMS) ALSO HAS A "FEW GOOD MEN" WORKING ON THE AAV AT THE WOODBRIDGE TECHNOLOGY CENTER. PICTURED FROM LEFT: GREG LANZON, GDAMS IPT LEAD FOR PROJECT MANAGEMENT AND DIRECTOR, PROJECT MANAGEMENT/FINANCE; MKE BOLON, VICE PRESIDENT, GDAMS; DAVID DUNN, GDAMS MANAGER, SUBCONTRACTS/MATERIEL.



ASSAULT VEHICLE - AAVV

the Prototype

SOMEBODY HAS TO TAKE CARE OF THE NUTS, BOLTS, FUEL, AND SUPPLY PARTS THAT KEEP THE AAVV RUNNING. MARK DELMONICO (RIGHT) IS THE AAVV DIRECTOR OF LOGISTICS.



SOMEONE HAS TO BE THE "EYES AND EARS" FOR THE PROGRAM OFFICE AND TAKE CARE OF CONTRACT ADMINISTRATION. "COOKIE" HERDT, PICTURED HERE WITH FEIGLEY, IS THE DEFENSE CONTRACT MANAGEMENT COMMAND'S AAVV PROGRAM INTEGRATOR. (EDITOR'S NOTE: HERDT RETIRED FROM FEDERAL SERVICE IN OCTOBER 1998.)



AV



WHAT ARE THE CHANCES OF GETTING ON THE CALENDARS OF FOUR KEY MANAGERS AT THE SAME TIME FOR A PHOTO OP? PICTURED FROM LEFT: BAYARD; FEIGLEY; LANZON; DUNN.

effort and the products are the products of the engineering staff, the program's success stems from the cooperation of all the disciplines, and in many cases the leadership of the business side."

Cost As an Independent Variable (CAIV)

Kathleen Francis, the AAV Director of Cost Estimating and Procurement, defines the CAIV process as a means of making performance and schedule a function of available resources and picking the right, affordable cost goal and sticking to it. Team members, she explains, use CAIV to develop, manage, and attain achievable cost objectives.

Francis notes that in addition to cost goals for the prime contract, General Dynamics Amphibious Systems (GDAMS) managers set cost goals for all their major subcontractors.

"On this particular program," says Francis, "subcontractors are approximately 50 percent of the cost. To validate cost goals established for the AAV program, the Project Management IPT [GDAMS and government] performed Critical Production Cost Reviews [CPCR] at all major subcontractor locations. These CPCR were designed to verify the methodologies and cost tools used to develop each subcontractor's unit production cost goal."

According to Francis, the IPT also looked at what it would cost the government in the future to produce the AAV based on its current design.

"Our goal," she explains, "was to identify high-cost drivers, identify cost risk, and develop mitigation plans. We also asked each subcontractor to suggest cost-reduction initiatives; essentially, we encouraged them to suggest ways that will provide the government a quality product, while at the same time considering ways to cut costs.

"We did not want our subcontractors to look only at the near-term," says Francis. "We wanted to ensure that they don't do something now that would save us

money in the short run, but end up costing us a lot if we try to support it during the O&S [Operations and Support] phase of the program."

As a result of the CPCR, Francis confirms that the IPT was able to get the unit cost down to "close to our program objective vice threshold." She's enthusiastic about the impact of the CPCR.

"We considered this *phenomena* because, generally speaking, early on in a program's life cycle, everyone is worried about where we are today, not where we will be in the future. Essentially, the process had been 'look at where we are today, worry about the next couple of years, and let the next 20 years take care of themselves.'"

David Dunn, GDAMS Manager, Subcontracts/Material, amplifies Francis' remarks on CAIV as an Acquisition Reform strategy. He refers to it as "more than a philosophy that we talk about in this program."

"It is, in fact," he asserts, "now embedded in all of the integrated processes that we have and the decision making that we do in this program. That is just part of the way we are trying to conduct business and make decisions."

Dunn also speaks of "thinking beyond the four walls of this facility to the far reaches of the United States and even across to Europe as well." In essence, he advocates extending the team's thinking and ideas for cost avoidances to include even geographically separated locations.

This, he believes, makes sense because at some point that farsighted thinking may, in fact, influence the decision making that's going on now at the Program Management Office level.

Says Dunn, "[CAIV is] allowing us to make decisions about what the vehicle system will have in its entirety in a way that hasn't really been done in the past...we're able to consider capability in the overall tradeoff process in a much more practical, meaningful way because

we have a good handle on what the cost is going to be."

Referring to CAIV as a very powerful and effective approach that has been taken to new heights within the AAV Program, Dunn had this to say: "We're not going to have to, at the end of the day, throw capability off of the vehicle to fit inside an established price for the vehicle." That, he emphasizes, is the bottom line of CAIV's benefit to the AAV Program.

Feigley fully supports the CAIV initiative as an important strategy to the program in terms of the gains being made on unit production cost and total life cycle cost. The AAV IPTs have an unprecedented level of awareness regarding how every design decision affects unit and life cycle cost. As a result, CAIV-based trades, he confirms, have resulted in cost avoidances of over \$207 million in procurement and over \$900 million in total life cycle costs.

"Overall," says Feigley, "treating cost as an independent variable has positioned and freed team members to explore new, innovative, more cost-effective business practices. He also adds to Kathleen Francis' and David Dunn's comments on the benefits of CAIV with a simple, profound, personal observation:

"There are some out there who believe that if cost is treated as an independent variable, somehow performance has to suffer. The Marines don't believe that. If you do it right and you're committed to it, you can do both. General Dynamics and the folks here at the Technology Center have proven that. We are in many cases exceeding our performance requirements at a lower price."

Streamlined Reviews/Oversight

The conduct of Design, Critical Design, and Defense Acquisition Board Reviews is another area Feigley cites as a far cry from reviews of the past. The review itself, Feigley explains, no longer, takes the form of a polished presentation. It is much more akin to an examination and discussion of actual work as it exists at that particular moment in the virtual

design database. It is not, Feigley maintains, a description of the products or assertions about the products.

"Every individual stands behind their work and presents it in its raw form, essentially, as it exists." The resulting dialogue, debate, criticism, and improvement from receiving first-hand information from those closest to the program, according to Feigley, clearly leads to increased understanding for not only the program team, but also those senior OSD executives charged with the program's oversight.

Rich Bayard maintains that the term "oversight," both by the Assistant Secretary of the Navy RD&A staff and the OSD staff, is almost a misnomer on the AAV Program. "We have been very successful in integrating the OSD analysts and action officers into our integrated product team environment, in part because of our location (only 15 minutes from the Pentagon), but also because of the culture that we have encouraged and established."

Bayard goes on to explain that, basically the AAV Program has an integrating IPT with membership from all the various disciplines within OSD. They meet periodically at the Woodbridge facility to work on the program, he emphasizes, not to review the program.

Underneath the integrating IPT, he adds, are a cost performance integrating IPT, a modeling and simulation IPT, a test and evaluation IPT, and other IPTs in the areas of logistics maintenance and management. Those "sub-IPTs" also have members drawn from OSD and are actively working with the AAV IPT to develop the plans and documents required for program success.

Bayard confirms that the presence of IPT members from OSD certainly does make life easier.

"They bring a lot of lessons learned to the table," he says, "that we find very valuable; at the same time we avoid that old-fashioned 'throw the paper over the transom to the folks up in the Pentagon, let them review it, and throw it back'



"For now, the quality of the prototype and not only its performance, but its projected price is what we're locked into. If we can pull it off the way we feel that it's possible to — that will be our next reward."

mindset. We've completely eliminated that, and it's been a great benefit."

Program Funding

Feigley is grateful for the program's relatively stable funding and believes it is a result of several things. "First of all," he points out, "the priority that AAV represents in the Marine Corps has been historically, is now, and will likely be in the future, the Marine Corps' No. 1 combat requirement."

He goes on to say that when you have something of such great need and priority within the Service itself, there tends to be less competition and less destabilization from an economic perspective.

"We have always been very straightforward with Congress," Feigley states, "on what we've done well, areas where we have made mistakes, or areas where we had temporary setbacks. I think that's helped us in many ways. And Congress, in turn, has been supportive of AAV."

Mark Delmonico, the AAV Director of Logistics, provides some insight into the AAV Program's Operations and Support (O&S) costs.

"Our Operations and Support cost, the actual affordability to the Corps," he notes, "has been an issue we have been addressing from design inception. Every trade analysis that we've done or plan to do addresses the impact of the proposed design alternatives on O&S costs."

According to Delmonico, "We do not focus solely on the need to drive DTUPC [Design-to-Unit Production Cost] down, increase technological capability, or reduce a particular design risk without also considering the long-term effect on affordability. We have to balance all of these items from a systems perspective when designing AAV."

Feigley says that from a comptroller's perspective, the AAV Program Team has never asked for more than what they believed they needed in a given year.

"Our execution," he notes, "has always been on the mark. Therefore, the elements that tend to destabilize a program — whether it be action by Congress, action by the comptroller world internal to the Pentagon, or action by our own Service — those three key areas we've been able to deal with honestly and effectively."

Challenges and Lessons Learned

Feigley and the team acknowledge that they expected and experienced a few unique challenges along the way. They share their insights and highlight a few areas program managers may wish to give careful consideration.

Adjusting to an IPT Environment

"An IPT, Feigley says, "is a journey." It requires continuous training, testing, and adjusting for change. One lesson

that Feigley and the team have tried to share with other programs as they embark down this path is to make sure that team members are given a basic understanding and commensurate skills so that they can be successful in this very different, challenging environment.

All of the participants on an IPT have specific roles. But the role of the government, the role of the contractor, and the role of the subcontractor are all very different.

"[An IPT] is not a democracy," says Feigley, "and it's not meant as a group meeting. It is highly structured, highly disciplined, and produces products, and there are some very significant rules that have to be adhered to in order to make and keep it successful. I would certainly point that out to anybody thinking about these matters or contemplating an IPT structure for their program." That aspect needs to be taken very seriously, he cautions.

Collocation Means Relocation

Another challenge was accepting the fact that along with collocation comes, inevitably, relocation. Feigley, in his view, has been extremely fortunate in assembling a high-quality team. However, he acknowledges that it was a major, major effort and it took time to get the right people on-board.

"We've got to make sure we retain them," he emphasizes, "and we've got to make sure we have a satisfied workforce — because they are the AAV Program."

Mike Bolon has first-hand knowledge and can attest to the workforce issues that prompt Feigley's emphasis on retaining a high-quality team. He readily admits the great demand for engineering talent throughout the Washington metropolitan area took him somewhat aback.

"We [General Dynamics] definitely underestimated the demanding effort that it took to draw the initial hiring.

"We moved from Michigan to Virginia," he continues, "into a new site, new lo-

cation, and new area. It took us a lot longer than we originally envisioned, even with help from some professional recruiters, not only from Detroit but from the Washington metropolitan area as well...it just took us a lot longer than we expected."

All told, according to Bolon, General Dynamics relocated 40 people to the Woodbridge, Va., facility.

Contract Administration and IPTs
Lois "Cookie" Herdt speaks of the challenges, as the DCMC AAV Program Integrator, of providing the customer (in this case the AAV Program Manager) contract administration services support in an IPT environment where the customer, procurement contracting officer, and DCMC are all collocated.

"Typically," says Herdt, "DCMC personnel are the eyes and ears for the program office and are located with or near the contractor. In this case, it's a first that we [DCMC Program Support Team] are located not only in the same facility with the contractor, but also with the program office.

"Some of the DCMC folks on the DCMC Program Support Team," she notes, "had not experienced working on IPTs. The program office has been very generous in providing IPT training and allowing each member of the DCMC Program Support Team the opportunity to participate in, and be a member of, an IPT."

[Herdt also points out that in some cases DCMC engineers serve on multiple IPTs.]

"Even though we're here, we [DCMC] have to maintain our independent analysis," she maintains. "The way of doing business is different than it's been in the past, simply because of collocation with the program office and being members of IPTs."

In some cases, this change in business practices has unexpected benefits. As an example, she cites how reporting processes have changed. DCMC normally does surveillance reporting and various program integration reporting. However, in keeping with the National Performance Review's initiative to reduce unneeded and unnecessary paper processes, the AAV Program Manager contends that if the reporting results in no value-added, then the program doesn't need it, and the contract administrators shouldn't do it.

Since the DCMC employees working on the AAV Program are collocated and members of IPTs, Herdt affirms that they are indeed part of the process, and are consistently given the opportunity to provide real-time insight. She notes that the AAV Program Manager has also expressed the increasing importance of DCMC during integration and assembly of the vehicle and during production, and encourages DCMC team members to continuously look for the "value-added."



Herd believes that, just as the DCMC employees in the Woodbridge facility have seen some changes, a number of other DCMC employees are going to notice some changes in the way DCMC will do business into the 21st century.

"We will have to strive for better ways of doing business," she concludes, "and in acquiring and integrating information that influences mission actions individually and as a team."

Logistical Awareness and Influence
Mark Delmonico refers to the importance of involving the logistics discipline in the early stages of program planning.

"For so long," he notes, "we've all been taught about the importance of logistics influence 'up front and early.' The integration of logisticians into all AAV IPTs, either from an overall system supportability perspective, or from an accessibility or maintainability perspective, has been crucial to designing AAV for supportability.

"Critical logistical questions are answered early — driving issues like, 'Are we going to organically maintain AAV, or out-source? What problems drive manpower requirements in the Fleet Marine Force for today's Assault Amphibious Vehicle operators and maintainers, and how can we eliminate them in the AAV's design?'

"Having that type of awareness and influence so early in the program," Delmonico maintains, "has allowed AAV logisticians to make significant design contributions to lowering AAV O&S costs."

He goes on to confirm that from his perspective as the AAV Director of Logistics, the biggest impact on planning logistics aspects of the program was getting all the logisticians involved and working with the designers, and clearly getting them to understand the AAV logistics interests and requirements.

"It's not just throw it over the transom to the logisticians, and you guys figure out how to maintain it." It's truly, according to Delmonico, getting the logis-



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ticians involved in the process and seeing what they can do to influence the design now before any need for expensive modifications surfaces.

Subcontractor Integration and Training
David Dunn speaks of the team's deliberate strategy to cultivate and integrate

subcontractors into the AAV Program "as if they were physically co-existing here with us at 991 Annapolis Way, Woodbridge, Va."

Dunn confirms that the team has made great strides in that regard, but at the same time, he acknowledges, "We recognize that there's a lot more that can be done. We have some limitations on tools that we want to work on and improve."

Leadership training, according to Dunn, is another dimension that the team wants to work on with respect to overseeing subcontractor performance within the context of an IPT environment.

"We recognize," Dunn says, "that IPTs in and of themselves don't answer all of the mail. There's a leadership aspect there that then gets extended beyond the four walls of this facility. And so even though we've made great progress, I think we have more work to do. We're interested in getting on with that work," he concludes, "and doing even more and better things in the future with subcontractors."

Leadership Brings Responsibility
Feigley actively practices the credo: "With leadership comes responsibility." Whether in a single-team organization or a whole team-based organization, Feigley is adamant that leaders owe their team members the authority and tools to enable them to be successful.

"You can't," says Feigley, "put the responsibility on them and then step back and let them rise (or fall) without the authority and means to get the job done."

He characterizes this attitude as a very different way of thinking about people in the organization.

"Unfortunately, he notes, "I've seen too many other examples where teams struggle, take risks, and are then blamed for their lack of success. That's certainly not the most effective way to do business."

With the advent of Acquisition Reform, DoD has empowered program managers to go out and take risks. Feigley insists

that when the AAAV Program Team members take those risks, they're fully equipped to *survive*.

Open Systems Architecture and the AAAV

The AAAV Program Team is committed to an Open Systems Architecture. David Dunn explains the team's Open Systems strategy.

"We have picked General Dynamics Amphibious Systems, at this point, as our principal supplier for the AAAV. We have as a goal — hopefully it's achievable — to enter in with them into a long-term relationship. However, we also believe that it's necessary to have a goodly amount of healthy competition from a cost perspective on the AAAV."

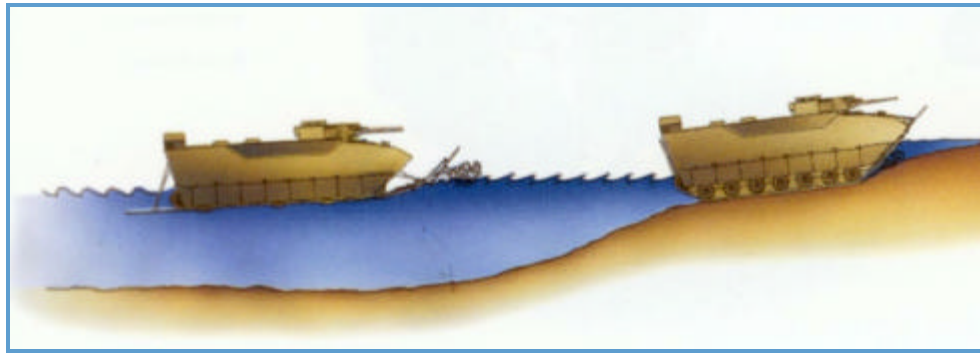
Dunn says that the team believes the way to achieve that healthy competition is at the subsystem and component level. He explains that if you have a design architecture that does not allow or is not flexible enough to readily change components or subsystems, or insert technology as it improves over time, or add the capability that previously was found to be unnecessary, yet a future threat requires it — if you have any or all of these, then you have an inflexible design architecture, which is pretty much a losing proposition across the board.

"Too many weapon systems that we've built in the past," Dunn notes, "have been inflexible and, therefore, it's been very expensive either to maintain or to improve them in the future...We wanted to get away from that so that we could introduce competition at a lower level than the system level and to allow the evolution of the system over time from a technology and performance perspective."

Feigley also applauds the aviation community's success with Open Systems Architecture.

Successes and Recognition

The AAAV Program Team has received numerous awards and honors for their success thus far in bringing the vehicle to prototype. To name a few:



- The 1996 Stratospheric Ozone Protection Award from the Environmental Protection Agency
- The 1996 and 1997 Department of the Navy Environmental Security Award
- The 1996 and 1997 Department of Defense Environmental Security Award
- The 1997 David Packard Award for Excellence in Acquisition
- The 1997 Secretary of Defense Superior Management Award
- The 1998 Department of Defense Value Engineering Honorary Achievement Award

When asked why the program has been so successful, Mike Bolon has a one-word answer: *planning*.

"From my perspective, planning has been such an essential ingredient throughout this whole process...The vision of the Marine Corps strategically has been well communicated, and following contract award we [General Dynamics] were able to get into some rather meticulous planning, frankly, above and beyond the kind of planning General Dynamics has historically been accustomed to."

Now, 26 months after contract award, Bolon confirms the entire team's appreciation and recognition of detailed planning as an essential value-added in terms of being able to execute the contract.

"Planning," he concludes, "has been key to some of our success and our ability to measure where we are day-to-day and anticipate some of the problems before they become meaningful."

Bolon confirms that not only was there a common understanding among team

members of the Marine Corps' vision, but also a common goal.

"I believe that everybody in this building has the common goal of fielding one of the best combat systems the Marine Corps has ever seen," says Bolon.

"Historically," he continues, "engineers that work in their cubicles or logisticians that work in their cubicles are more concerned about their product, their document, their subsystem, and are not necessarily focused on that end item of fielding the total system for the Marine Corps."

The AAAV Program Team, according to Bolon, has reversed that trend.

"Here [Woodbridge facility], the IPT process and the collocation has made everybody acutely aware of how important this system is to the Marine Corps and to national security. And so together, everybody is working toward that same end. And that energy," Bolon concludes, "and that objective creates success...It really does!"

Greg Lanzon, GDAMS IPT Lead for Project Management and Director, Project Management/Finance, believes that the success of the program is the result of four key attributes.

"First is empowerment of the IPTs, says Lanzon. "We gave them budgets; we gave them resources; we gave them tools; and we said, 'design, build, and test the vehicle within the confines of these rules.'"

"Second is decision making." According to Lanzon, the impact of IPT structure and collocation has reduced the amount

of time required to make decisions. "Normally," he points out, "decisions are made within two weeks, which is much quicker than on other projects that I have worked on.

"Third is the team's risk management process." Lanzon states unequivocally that "We have a risk management process that is unparalleled anywhere on any program.

"Fourth is the integration of the business team within the Product IPTs."

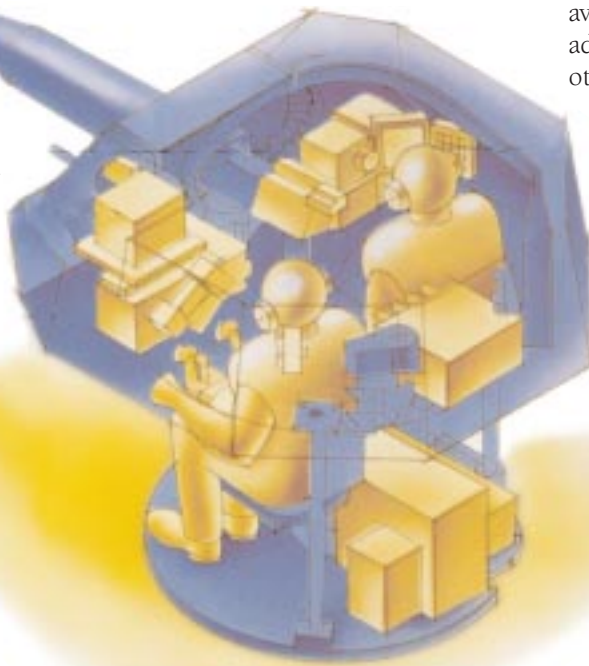
Lanzon relates that in February and March 1998, the vehicle weight and unit production costs were growing. To

reduce weight and cost, the business team designed a contest called 50/50. Basically, teams were awarded \$50 for every pound in savings and/or \$250 reduction in unit production cost. The award was based on net reductions to avoid paying for weight savings if the savings resulted in a unit production cost increase. And it worked – the program achieved a 1500-lb. weight savings and \$100K savings off the unit production cost.

Finally, Lanzon says that in addition to the four attributes cited, strong leadership and commitment have an extremely important effect on program success. Mentioning those leaders by name, he had this to say:

"Leadership begins at the top. Both General Feigley and Mike Bolon are very effective leaders, and they are committed to the success of this program. They are here. They are not traveling. They are not working some other agenda. They are here, living and breathing the program on a daily basis. They're working the decisions, the challenges, and the risks."

"[AAAV] provides the kind of mobility that any military force needs, whether it's in high-intensity operations or even in non-combatant evacuations or operations other than war."



As program manager and leader of this very capable team of acquisition professionals, Feigley boils their success down to this:

"The [Woodbridge] team has been very successful and has deserved all of the awards they've received. They are going to continue to work hard and hopefully there'll be a few more for them in the future."

Those awards, he notes, however wonderful, are past accomplishments, and he prefers to concentrate on the work to be done now, but with an eye toward the future and the next challenge.

"For now," says Feigley, "the quality of the prototype and not only its performance, but its projected price, is what we're locked into. If we can pull it off the way we feel that it's possible to – that will be our next reward."

Future Applications

The United States is constantly in a state of building weapons they hope they will never have to use.

Says Feigley, "The ultimate application of any weapon is always a human tragedy, and it's something that hopefully we can avoid. But if the situation requires it," he adds, "I would not want to be on the other end of AA-7V. Our enemies will fear the presence of this machine. I think that's probably the best thing I can say about its capabilities."

Feigley and the entire team believe the AA-7V will be not only used, but also used extensively. And not necessarily as a weapon of war in a major conflict.

AA-7V, Feigley explains, is highly versatile. Wherever there's trouble, he believes AA-7V will be where it counts. Whether it's extracting hostages or rescuing people in hurricanes, AA-7V will be capable of fulfilling roles other than combat.

Mike Bolon relates a little known, but interesting fact about the first amphibious vehicle. Originally, the vehicle was designed as a means to rescue people during hurricanes in Florida back in the 1930s. It was not until 1940 that the Marines saw the potential of its military application as the first real amphibious vehicle.

Feigley adds a more in-depth description of AA-7V's versatility. "The AA-7V is not just designed for conducting

amphibious operations under combat conditions, of which it is ideally suited, but it also provides the kind of mobility that any military force needs, whether it's in high-intensity operations or even in non-combatant evacuations or operations other than war."

In places like Somalia or other nations, Feigley notes that AAV will give any military force the mobility to transport general supplies, medical supplies, food, or life-saving equipment across terrain that is often very poor as it relates to lines of communication.

Says Feigley, "AAV's cross-country and water mobility are such, that it can deliver tons of supplies under extreme physical circumstances where other kinds of conveyances just can't do the job. Whether it's carrying 5,000 pounds of Marines or 5,000 pounds of rice, AAV is equally effective," according to Feigley. He is confident that even though the mission may change, AAV's continued applicability and need will remain.

Prototype in the Making

Feigley speaks with pride and enthusiasm about the first AAV prototype. Currently, the Woodbridge facility houses several modeling and simulation tools — models and simulations that the AAV engineers and logisticians have used over the past couple of years in designing the prototype.

And now, according to Feigley, "Those same engineers and logisticians are going to be participating in the assembly and fabrication of three prototypes here in the [Woodbridge] facility, starting in December 1998."

Rich Bayard explains that the first prototype is planned to undergo some shakedown testing by the contractor, followed by Roll-Out in August of 1999. And the second prototype, he explains, will follow two months behind that, with the third prototype two months behind the second prototype.

"From there," Bayard continues, "we'll go on to a December 1999/January 2000 time frame, when the government will

take the prototypes and head off to the various test facilities in Maryland, California, and Florida to test the AAV prototypes against all of the requirements that the Marine Corps has laid out for them."

And following successful testing, Bayard states that the program will come up for its next milestone Defense Acquisition Board Review (now scheduled for January of 2001 at the Pentagon). At that time, the team will present AAV's successful testing results to the Defense Acquisition Board, which has the authority to grant permission for the program to move forward to the next phase.

One Last Word

In one respect, Feigley is a "victim" of his own success. Holding the rank of colonel throughout the duration of his tenure as AAV Direct Reporting Program Manager, in August 1998 the Marine Corps promoted him to the rank of brigadier general. He has indeed become one of the distinct minority of "Proud But Few" Marines who ultimately attain the rank of flag officer. But that promotion came at a price.

On August 6, 1998, he relinquished control of the program he so capably led, said good-bye to his team, and welcomed his successor, Marine Col. Blake J. Robertson.⁵ Feigley now serves as the

Commander, Marine Corps Systems Command (MARCORSYSCOM), at Quantico Marine Base — a position for which he is eminently qualified.

Before he left to assume his new duties, *Program Manager* invited him to convey any personal words he might like to leave his team members and the acquisition workforce at large, based on his experiences with the AAV Program.

His response reveals a side of the man and his character the Marine Corps saw years ago as they promoted him through the ranks, all the way from second lieutenant to general officer: *He values people and they, in turn, value him.*

"If I had to say one thing that particularly stands out in my experiences here and throughout the five years I've been associated with this program and others, it would be that defense acquisition has always been, is now, and I believe will remain in the future, principally a human endeavor. And while we can create a lot of processes, use a lot of tools by which to improve and speed up our work, all the important things sooner or later come down to people, their intellectual abilities, and their capability to work with other people. Those out there who think that it's otherwise have something to learn."

ENDNOTES

1. Feigley notes that the Marine Corps analyzes new requirements using a process called a concept-based requirements system. The user representative for that system is the Marine Corps Combat Development Command at Quantico, Va.

2. As one of only three Direct Reporting Program Managers throughout the Department of Navy, "Direct Reporting" simply means that Feigley reported directly to the Assistant Secretary of the Navy for Research, Development, and Acquisition.

3. General Dynamics Amphibious Systems, once awarded the AAV contract, purchased the Woodbridge, Va., facility

and moved into the building in 1996. They had the building configured specifically to accommodate the integrated product team environment.

4. Twenty companies from around the nation have joined forces in support of the project to incorporate new ideas in communications, logistics, and command and control to provide upgrades in intelligence, weaponry, and engineering with the goal of producing the best possible amphibious assault vehicle.

5. Marine Col. Blake J. Robertson assumed duties as the AAV Direct Reporting Program Manager on Aug. 6, 1998.